



**User Manual for the  
*HE150THM180***

# **Thermocouple Input Module**

**Fifth Edition  
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**MAN0004-05**

## PREFACE

This manual explains how to use Horner APG's Thermocouple Input module for the Hitachi® H-series, EM-II series or Reliance Shark XL PLC.

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**Historic Note:** Editions 1-4 of the User Manual contained the former product part number 45C-THM. Starting with the fifth edition, the product part number was changed to HE150THM180.

***For user manual updates, contact Horner APG, LLC., Technical Support Division, at (317) 916-4274 or visit our website at [www.heapg.com](http://www.heapg.com).***

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## ABOUT PROGRAMMING EXAMPLES

Any example programs and program segments in this manual or provided on accompanying diskettes are included solely for illustrative purposes. Due to the many variables and requirements associated with any particular installation, Horner APG cannot assume responsibility or liability for actual use based on the examples and diagrams. It is the sole responsibility of the system designer utilizing the Thermocouple Input module to appropriately design the end system, to appropriately integrate the Thermocouple Input module and to make safety provisions for the end equipment as is usual and customary in industrial applications as defined in any codes or standards which apply.

**Note: The programming examples shown in this manual are illustrative only. Proper machine operation is the sole responsibility of the system integrator.**

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CHAPTER 1: INTRODUCTION

1.1 Description

1.1.1 The Horner APG Thermocouple Input module allows thermocouple temperature sensors to be directly connected to the PLC without external signal processing (transducers, transmitters, etc.). All analog and digital processing of the thermocouple signal is performed by the module. The HE150THM180 modules have a resolution of 0.5°C or 0.5°F. Temperature values are reported to the PLC I/O tables in 0.5°C or 0.5°F increments. The module features open circuit detection which is when the temperature value written to the analog input register (WX for H-Series) goes to its maximum value upon an open circuit condition (i.e., break in the thermocouple wire).

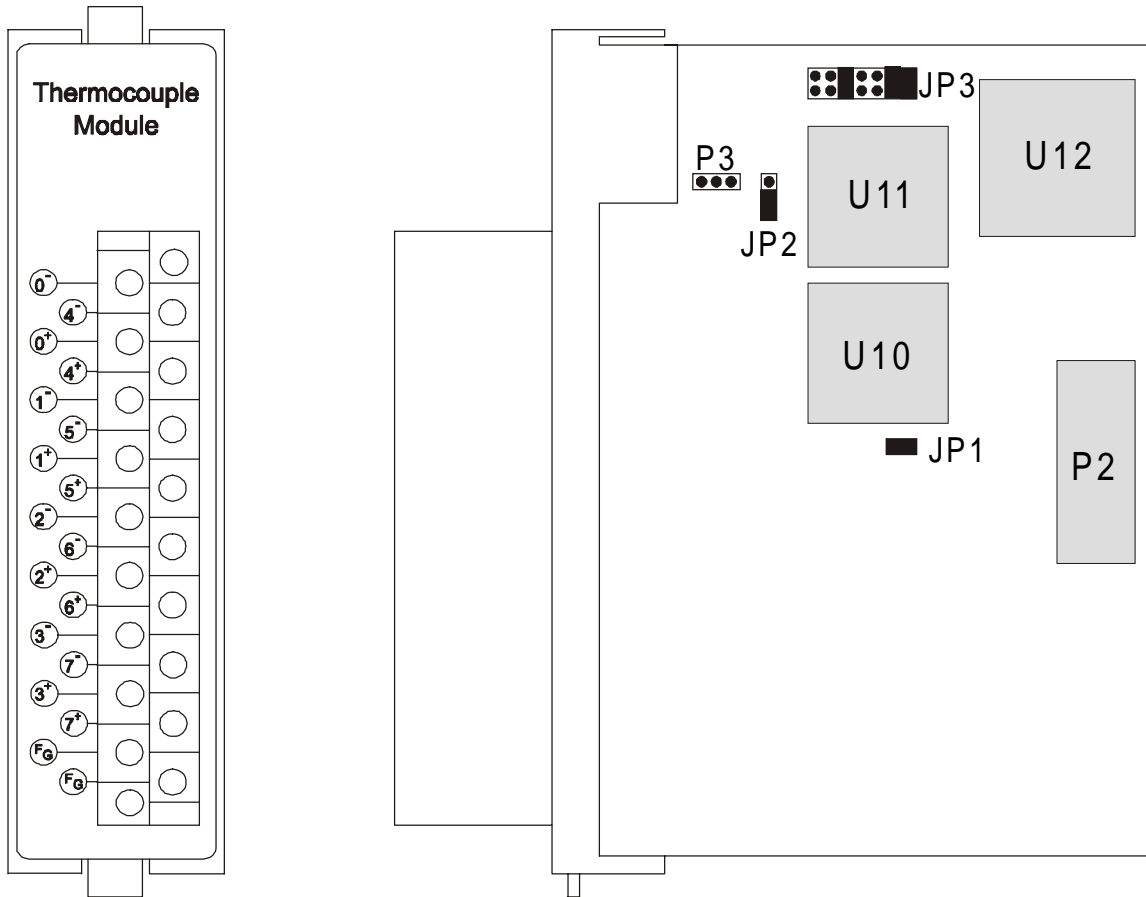


Figure 1.1 – The HE150THM180

Table 1.1 – Jumper Descriptions	
<b>P3</b>	Calibration Port. <b>Never</b> place jumpers on any part of P3
<b>JP1</b>	Sets CPU type (see Section 3.1)
<b>JP2</b>	Watch-dog enable (jumper always installed on the two pins closest to C37 (as in Figure 1.1)
<b>JP3</b>	Thermocouple wire type and filtering configuration jumpers (see Section 3.3 and Chapter 4)

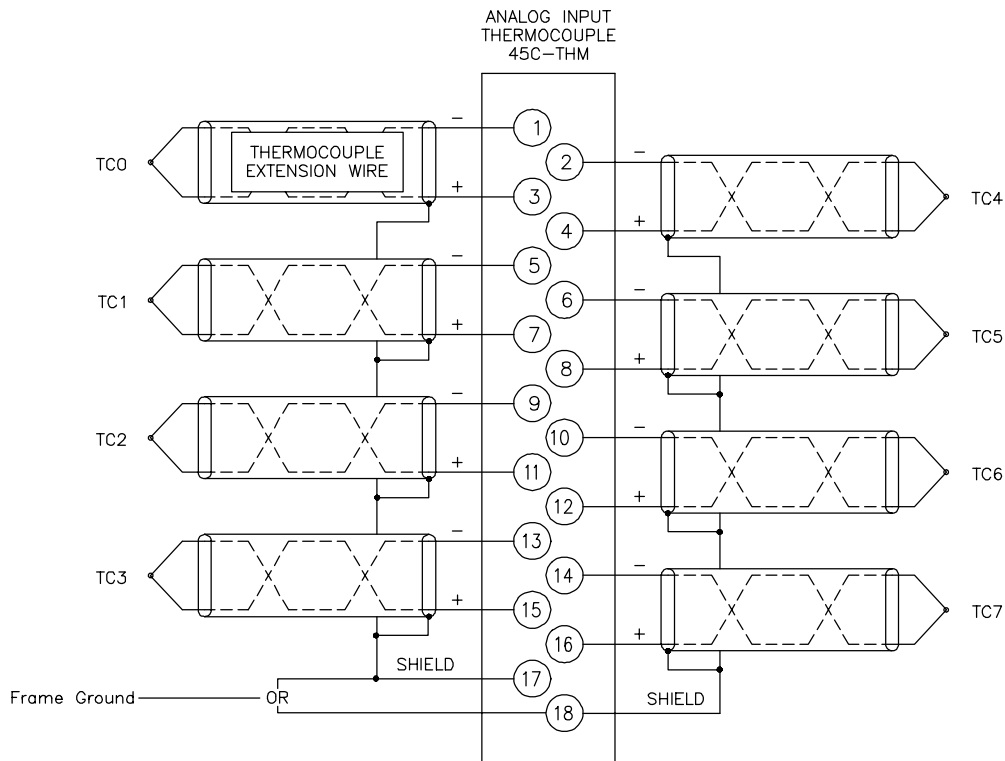
## 1.2 Specifications

Table 1.2 - Specifications				
Specification	HE150THM180		Specification	HE150THM180
Power Consumption	80mA @ 5V, 20mA @ 24V		I/O Points Required	8 input words (WX)
Number of Channels	8		Slot Requirements	Single I/O
Types Supported	J, K, N, T, E, R, S, C		Input Impedance	20 M $\Omega$
Input Temperature Range (°C)	J: -210 TO +760	E: -270 TO +1000	Maximum Safe Overload	$\pm$ 35VDC
	K: -270 TO +1372	R: 0 TO +1768	Common Mode Range	$\pm$ 12VDC
	N: -270 TO +1300	S: 0 TO +1768	A/D conversion Type	Integrating
	T: -270 TO +400	C: 0 TO +2330	Scan Rate	40 conversion/ s
Accuracy	$\pm$ 1.0 °C maximum		Resolution	0.5°C or 0.5°F
Noise Filter	1 kHz 3rd Order Low-pass		Operating Temperature	0 to 60 °C
Compensation	Internal Cold Junction		Relative Humidity	5 to 95% non-condensing

## CHAPTER 2: INSTALLATION

### 2.1 Wiring

2.1.1 Figure 2.1 illustrates the connections for proper thermocouple use.



**Figure 2.1 – Normal Wiring Connection**

### 2.2 Installation Requirements

2.1.2 The following installation practices should be observed when installing and using the HE150THM180 Thermocouple Input module:

- a) Terminal 17 and 18 should be connected to earth ground on the PLC power supply to ensure proper filtering and noise protection;
- b) The module should be placed in the slot furthest from the power supply to avoid radiated noise and heat from the power supply;
- c) Special care must be taken with grounded junction sensors to avoid applying a voltage to the thermocouple input junction;
- d) Extension thermocouple wire of the proper type must be used;
- e) Keep the total wire resistance less than  $100\Omega$  to maintain the module's rated accuracy;
- f) Extension wiring should be routed in its own conduit. Shielded, twisted pair extension wire offers the best noise resistance; and
- g) If shielded wire is used, a good earth ground connection to terminal 17 or 18 must be applied.



## CHAPTER 3: CONFIGURATION

### 3.1 CPU Type

3.1.1 The HE150THM180 operates with any Hitachi® H-series, EM-II series or Reliance Shark XL series CPU that supports 8 16-bit word input points.

Table 3.1 – CPU Type	
Hitachi® H-250, 252 or 252B	JP1 installed
Hitachi® EM-II or, Reliance Shark XL series	JP1 removed
JP2 is installed on the 2 pins closest to C37 for all CPUs	

### 3.2 PLC Setup

3.2.1 The HE150THM180 is set up with the PLC as an eight-word input module. Using Actsip-H programming software, go to **PLC setup, I/O assignment** and set the module as a **W INP X8W** in the applicable slot and unit.

### 3.3 Temperature Format

3.3.1 The format of the data reported to the backplane is set by position 7 of JP3.

Table 3.2 - JP3 Temperature Format	
Data Format	Jumper Position 7
0.5°C	Installed
0.5°F	Removed

### 3.4 Temperature Scaling

3.4.1 The temperature values reported to the WX registers (H-series PLCs) are not the real world temperatures and depend on the temperature format used. As such, the register values must be scaled to give real world temperatures. The scaling formulae are listed in the following table.

Table 3.3 – Temperature Scaling Equations	
Data Format	Formula
0.5°C	$^{\circ}\text{C} = (\text{WX} - 540) / 2$
0.5°F	$^{\circ}\text{F} = (\text{WX} - 908) / 2$

### 3.5 Thermocouple Wire Type

3.5.1 The thermocouple type is set by positions 4, 5 and 6 of JP3.

Table 3.4 – Thermocouple Wire Type			
Thermocouple Type	Jumper Position 4	Jumper Position 5	Jumper Position 6
J	Installed	Installed	Installed
K	Removed	Installed	Installed
N	Installed	Removed	Installed
T	Removed	Removed	Installed
E	Installed	Installed	Removed
R	Removed	Installed	Removed
S	Installed	Removed	Removed
C	Removed	Removed	Removed

## CHAPTER 4: DIGITAL FILTERING

### 4.1 Overview

4.1.1 The digital filtering sets the update time of the module as shown in the Figure 4.1.

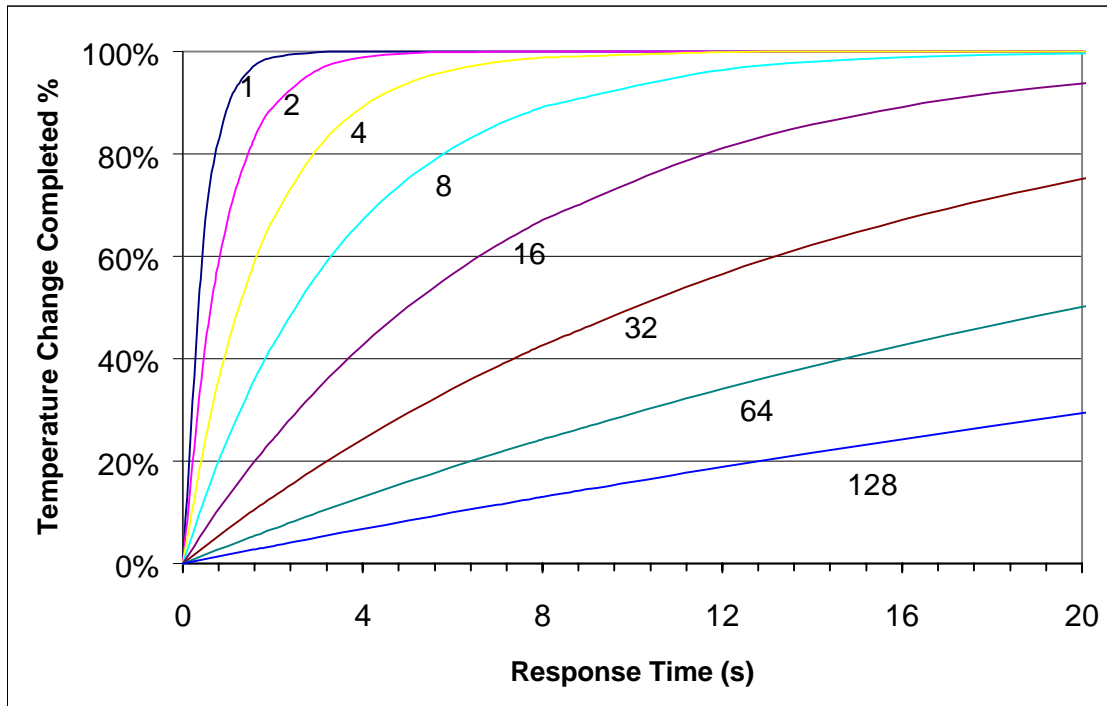


Figure 4.1 – Digital Filtering

### 4.2 Digital Filtering Configuration

4.2.1 Digital filtering is set by positions 1, 2 and 3 of JP3.

Table 4.1 – Digital Filtering Configuration			
Digital Filtering	Jumper Position 1	Jumper Position 2	Jumper Position 3
1 sample/update	Installed	Installed	Installed
2 sample/update	Removed	Installed	Installed
4 sample/update	Installed	Removed	Installed
8 sample/update	Removed	Removed	Installed
16 sample/update	Installed	Installed	Removed
32 sample/update	Removed	Installed	Removed
64 sample/update	Installed	Removed	Removed
128 sample/update	Removed	Removed	Removed